AXIOMTEK

# NA150

## Network Appliance

## User's Manual

## Disclaimers

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## Safety Approvals

- CE Marking
- FCC Compliance

## Safety Precautions

Before getting started, read the following important cautions.

1. Be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and place all electronic components in any static-shielded devices. Most electronic components are sensitive to static electrical charge.
2. Disconnect the power cords from the **NA150** before making any installation. Be sure both the system and the external devices are turned OFF. Sudden surge of power could ruin sensitive components. Make sure the **NA150** is properly grounded.
3. Do not open the system's top cover. If opening the cover for maintenance is a must, only a trained technician is allowed to do so. Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:

    - Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This will help to discharge any static electricity on your body.
    - When handling boards and components, wear a wrist-grounding strap, available from most electronic component stores.

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# CHAPTER 1
# INTRODUCTION

This chapter contains general information and detailed specifications of the NA150 Network Appliance Server. Chapter 1 contains the following sections:

- **General Description**
- **Features**
- **Specifications**
- **Dimensions**
- **I/O Outlets**

## 1.1 General Description

The NA150 is a 1U desktop security hardware platform for VPN, firewall and other network security applications, which consists Marvell® Armada370 SOC. The system supports onboard DDR3L 1066/1333 memory up to maximum 1 GB. In addition, the platform supports 1 Gigabit WAN port and 4 gigabit switch ports which can provide best throughput. For the purpose of storing event log data, it can deploy one 2.5" HDD SATA drive and one mSATA for optional.

This platform can be easily enabled through application programs to make a user-friendly appliance for customers, and provide the highest ever performance of encryption and decryption.

## 1.2 Features

Low power and high performance for network security field applications. NA150 series supports Marvell® Armada370 Soc.

- **Supports One 10/100/1000Mbps WAN port**
- **Supports Four 10/100/1000Mbps Switch ports**
- **Support 2.5" HDD SATA drive and one mSATA for optional**
- **Reasonable computing performance and throughput for processor and LAN ports**
- **Suitable for Network Appliance; VPN, network bandwidth controller, firewall and UTM**

# 1.3 Specifications

## 1.3.1 System

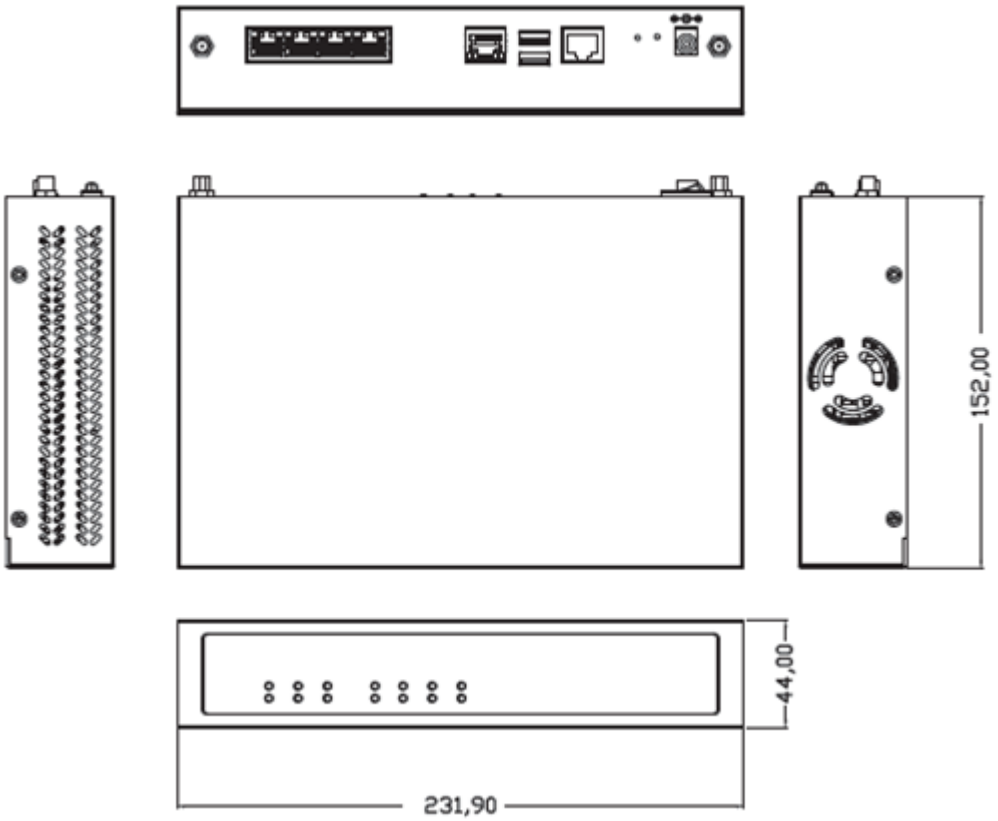
- **System CPU**
  - Marvell® Amada 370
- **uBoot**
  - Marvell u-boot-2011.12.
  - 8Mbit SPI Flash
- **System Memory**
  - Onboard DDR3L 1066/1333 memory 512M. (1GB for optional)
- **HDD Interface**
  - Supports one 2.5" HDD SATA drive and one mSATA for optional
- **SD Interface**
  - SD socket on board
  - Integred 8GB SD card with Linux kernel(BSP)
- **Network Interface**
  - 5 10/100/1000Mbps (1 Giga WAN port and 4 Giga switch ports)
- **USB**
  - Two USB ports located on the front side (2XUSB2.0)
- **Console**
  - RS-232 Console port located on the front side(RJ-type)
- **Power**
  - 1 x 12V/5A 60W power adapter
- **OS Compatibility**
  - Linux kernel -3.2.58

### 1.3.2 Mechanical / Environmental

- **Form Factor**
  - 1U Desktop
- **LED**
  - Power, HDD, GPO, Link/Act with transfer rate
- **Operation Temperature**
  - 0°C ~ 40°C (32°F ~ 104°F)
- **Storage Temperature**
  - -20°C ~ 70°C (-4°F ~ 158°F)
- **Humidity**
  - 10% - 95% RH, non-condensing
- **Chassis Material**
  - Steel
- **Dimensions**
  - 44mm (1.73") (H) x 231.9m (9.09") (W) x 152m (5.98) (D)
- **Weight (Net/Gross)**
  - 1.128 kg / 2.036Kg

***NOTE:*** ***All specifications and images are subject to change without notice.***

## 1.4 Dimensions and Outlines



## 1.5 I/O Outlets

Locate the front panel I/O outlets on the **NA150 Series** server to connect serial and Ethernet interface devices.

### 1.5.1 Front Panel

- **Programmable LED**

  See Chapter 3.8 How to use GPIO to control status LED and push buttons

- **Power LED**

  Will be lit when the server is powered on to perform diagnostic tests and check for proper operation.

- **LAN Link LED**

  Will be lighted when a twisted pair is connected to another Ethernet device on the port. It shows network transfer rate while making a connection.

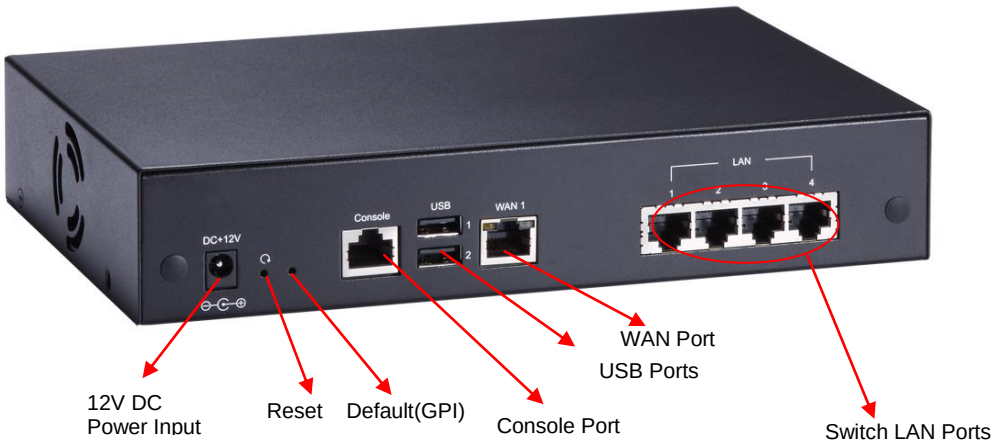
- **LAN Activity LED**

  Will be lighted when the server is transmitting or receiving a packet through the twisted pair ports.

- **HDD LED**

  Flashes when transmitting or receiving any signals.

### 1.5.2 Rear Panel




- **Reset Button**

  Used to reset the system and reboot your computer instead of turning OFF the power. This method increases life expectancy of power supply

- **Default Button**

  See Chapter 3.8 How to use GPIO to control status LED and push buttons

- **Console port**

  RS-232 Console port is for the command of line interface and of diagnostic support by P.O.S.T (Power on Self Test).

- **Active/Link LED (Single color)for LAN port #1, port#2, port#3, port#4**

  1. The orange LED is on when the LAN port connection is working.
  2. The LED flashes when transmitting or receiving any signals to or from the appliance.
  3. The LED is dark when the appliance is off.

| Link LED Color | Active LED Color |
|---|---|
| Green | Orange |

- **Active /Link LED for WAN**

  1. The double-color LED light indicates a 10/100/1000Mbps transfer rate.
  2. The green light indicates a 1000Mbps transfer rate
  3. The amber light indicates a 100Mbps transfer rate
  4. If the LED is dark and Link/Active LED is lit or flashing, it indicates a 10Mbps transfer rate.
  5. Active LED color is orange
  6. When LED and Link/Active LED are both dark, no networking devices are attached

| Transfer Rate | LED Light Color |
|---|---|
| 10Mbps | Dark |
| 100Mbps | Amber |
| 1000Mbps | Green |

# CHAPTER 2
# HARDWARE DESCRIPTION

The NA150 Series is convenient for various hardware configurations. Chapter 2 introduces the hardware.

## 2.1 Checklist

The package bundled with the NA150 Series should contain the following items:

- **DC Power Adapter x 1,Power cord x 1**
- **Mounting screws for disk drive x 4**
- **Cable kits (1 x SATA cable, 1 x SATA power cable)**
- **Plastic stand for stack–up x 4**

If the package or any of its contents are missing, please contact AXIOMTEK distributors immediately. If any optional components have been ordered, the package may contain the additional hardware or documents accordingly.

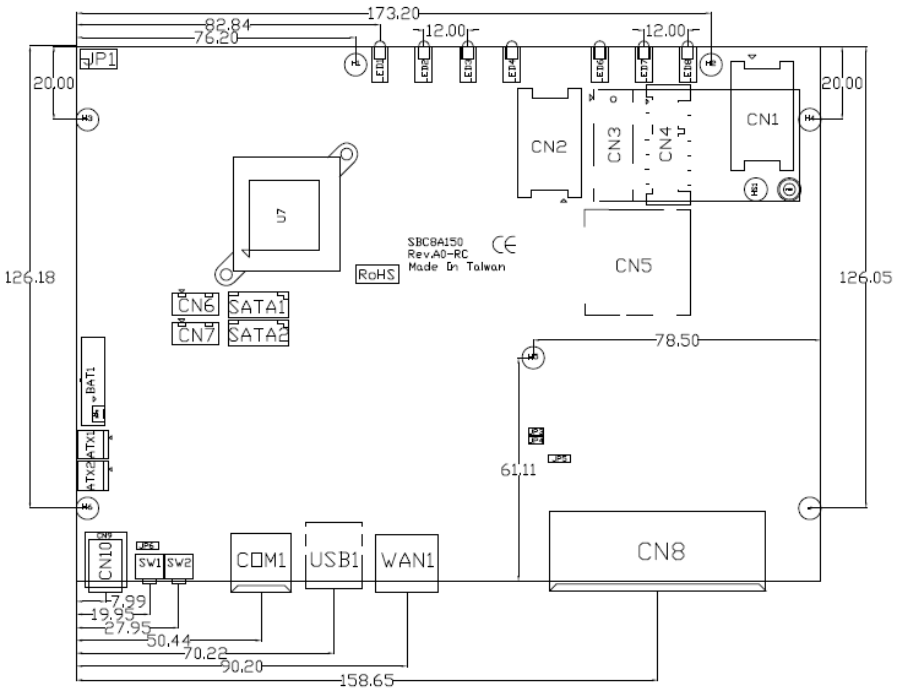
## 2.2 Hard Disk Installation (2.5')

When installing 2.5'HDD:

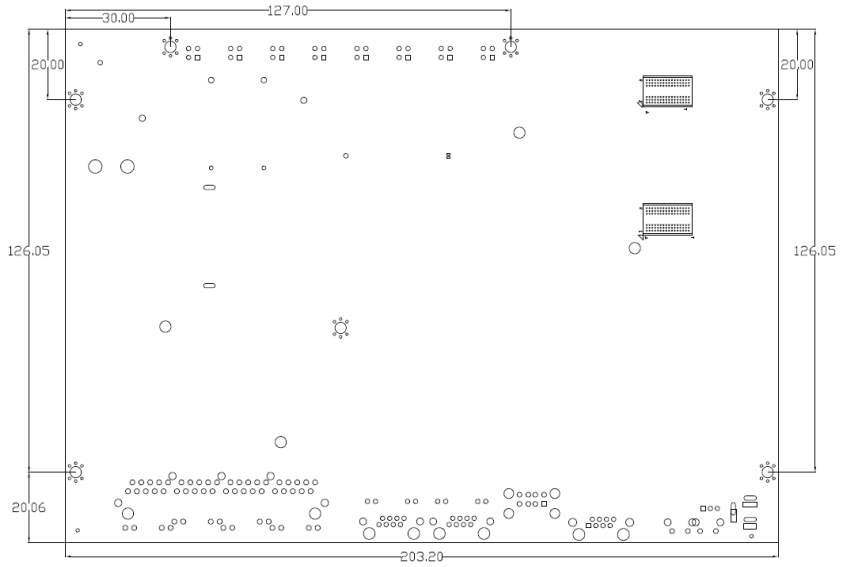
If the height is 9mm, it is recommended to fasten the screws on both the right and left sides. If the height is 15mm, please fasten the screws at the bottom of the bracket.

## 2.3 Board Layout

**Component Side**




**Solder Side**



## 2.4 Jumper Settings

This section provides information about jumpers and connectors of the NA-150 Series. Proper jumper settings configure the main board in this appliance to meet the application purpose. We are herewith listing a summary table of all jumpers and default settings for onboard devices, respectively.

### 2.4.1 TACT SW1 Selection (JP6)

| Description | Function | Jumper Setting |
|---|---|---|
| TACT SW1 Function | GPI | 3 2 1 |
| | Reset (Default) | 3 2 1 |

## 2.5 Connectors

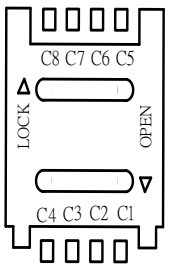
Connectors connect the board with other parts of the system. Loose or improper connection might cause problems. Ensure that all connectors are properly and firmly connected. Below is a summery table of all connectors on the main board.

| Connectors | Label |
|---|---|
| SIM Socket 1 (optional) | CN1 |
| SIM Socket 2 (optional) | CN2 |
| MINI PCIe SLOT 2 | CN3 |
| MINI PCIe SLOT 1 | CN4 |
| SD Card Socket | CN5 |
| SATA Power Connector | CN6 |
| SATA Power Connector (Optional) | CN7 |
| LAN1 ~ LAN4 Connector | CN8 |
| DC12V In Power Jack | CN10 |
| Power Input 12V Connector (Optional) | ATX1 |
| DC12V Power Switch (Optional) | ATX2 |
| Serial port1 RJ-type | COM1 |
| USB 2.0 Connector | USB1 |
| WAN1 Connector | WAN1 |
| Serial ATA Connector | SATA1 |
| Serial ATA Connector (optional) | SATA2 |
| System FAN Connector (optional) | FAN1 |
| Front Panel Bezel Connector | JP1 |

### 2.5.1 SIM Socket (CN1/CN2) (Optional)

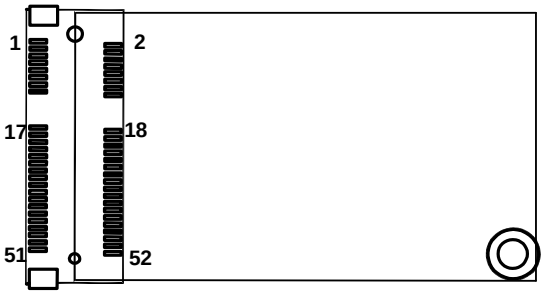
In order to work properly, the SIM Card must be used together with the Mini Card which is inserted to socket CN2. It is mainly used in the 3G wireless network application.

| Pin | Signal |
|---|---|
| C1 | PWR |
| C2 | RST |
| C3 | CLK |
| C4 | No use |
| C5 | Ground (GND) |
| C6 | VPP |
| C7 | DATA |
| C8 | No use |



### 2.5.2 MINI PCIe SLOT 1 (CN3)

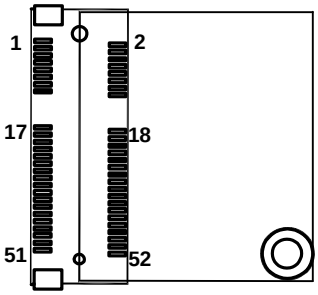
The PCI-Express Mini Card socket supports m-SATA signal and USB 2.0 signal.




| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | WAKE# | 2 | +3.3VSB |
| 3 | No use | 4 | Ground (GND) |
| 5 | No use | 6 | +1.5V |
| 7 | CLKREQ# | 8 | No use |
| 9 | Ground (GND) | 10 | No use |
| 11 | REFCLK- | 12 | No use |
| 13 | REFCLK+ | 14 | No use |
| 15 | Ground (GND) | 16 | No use |
| 17 | No use | 18 | Ground (GND) |
| 19 | No use | 20 | W_DISABLE# |
| 21 | Ground (GND) | 22 | PERST# |
| 23 | SATA_RXP | 24 | +3.3VSB |
| 25 | SATA_RXN | 26 | Ground (GND) |
| 27 | Ground (GND) | 28 | +1.5V |
| 29 | Ground (GND) | 30 | SMB_CLK |
| 31 | SATA_TXN | 32 | SMB_DATA |
| 33 | SATA_TXP | 34 | Ground (GND) |
| 35 | Ground (GND) | 36 | USB_D2- |
| 37 | Ground (GND) | 38 | USB_D2+ |
| 39 | +3.3VSB | 40 | Ground (GND) |
| 41 | +3.3VSB | 42 | LED_WWAN# |
| 43 | Ground (GND) | 44 | LED_WLAN# |
| 45 | No use | 46 | LED_WPAN# |
| 47 | No use | 48 | +1.5V |
| 49 | No use | 50 | Ground (GND) |
| 51 | No use | 52 | +3.3VSB |

### 2.5.3 MINI PCIe SLOT 2 (CN4)

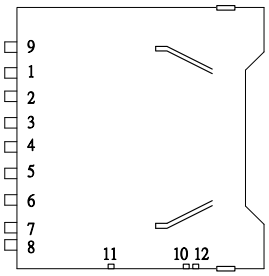
The PCI-Express Mini Card socket supports PCI-Express x1 link. It complies with PCI-Express Mini Card Spec. V1.2.




| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | WAKE# | 2 | +3.3VSB |
| 3 | No use | 4 | Ground (GND) |
| 5 | No use | 6 | +1.5V |
| 7 | CLKREQ# | 8 | No use |
| 9 | Ground (GND) | 10 | No use |
| 11 | REFCLK- | 12 | No use |
| 13 | REFCLK+ | 14 | No use |
| 15 | Ground (GND) | 16 | No use |
| 17 | No use | 18 | Ground (GND) |
| 19 | No use | 20 | W_DISABLE# |
| 21 | Ground (GND) | 22 | PERST# |
| 23 | PE_RXN1 | 24 | +3.3VSB |
| 25 | PE_RXP1 | 26 | Ground (GND) |
| 27 | Ground (GND) | 28 | +1.5V |
| 29 | Ground (GND) | 30 | SMB_CLK |
| 31 | PE_TXN1 | 32 | SMB_DATA |
| 33 | PE_TXP1 | 34 | Ground (GND) |
| 35 | Ground (GND) | 36 | No use |
| 37 | Ground (GND) | 38 | No use |
| 39 | +3.3VSB | 40 | Ground (GND) |
| 41 | +3.3VSB | 42 | LED_WWAN# |
| 43 | Ground (GND) | 44 | LED_WLAN# |
| 45 | No use | 46 | LED_WPAN# |
| 47 | No use | 48 | +1.5V |
| 49 | No use | 50 | Ground (GND) |
| 51 | No use | 52 | +3.3VSB |

### 2.5.4 SD Card Connector (CN5)

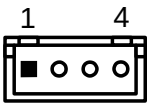
| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | DATA3 | 2 | CMD |
| 3 | Ground (GND) | 4 | +3.3V Level |
| 5 | CLK | 6 | Ground (GND) |
| 7 | DATA0 | 8 | DATA1 |
| 9 | DATA2 | 10 | WP |
| 11 | Status | 12 | Ground (GND) |



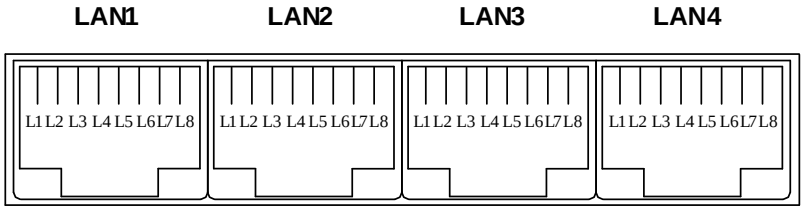

### 2.5.5 SATA Power Connector (CN6/CN7)

Supports 2.5" SATA HDD power

| Pin | Signal |
|---|---|
| 1 | +5V Level |
| 2 | Ground (GND) |
| 3 | Ground (GND) |
| 4 | +12V Level |



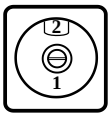

### 2.5.6 LAN1 ~ LAN4 Connector (CN8)




| Pin | Signal | Pin | Signal |
|---|---|---|---|
| L1 | MDI0+ | L5 | MDI2+ |
| L2 | MDI0- | L6 | MDI2- |
| L3 | MDI1+ | L7 | MDI3+ |
| L4 | MDI1- | L8 | MDI3- |

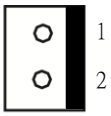
### 2.5.7 DC12V In Power Jack (CN10)

| Pin | Signal |
|---|---|
| 1 | +12V |
| 2 | Ground (GND) |



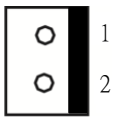

### 2.5.8 Power Input 12V Connector (ATX1) (Optional)

| Pin | Signal |
|---|---|
| 1 | Ground (GND) |
| 2 | +12V |




### 2.5.9 DC12V Power Switch Connector (ATX2) (Optional)

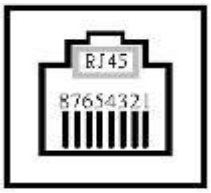
| Pin | Signal |
|---|---|
| 1 | DC_12V1 |
| 2 | DC_12V2 |




### 2.5.10 Serial Port1 For Console (COM1)

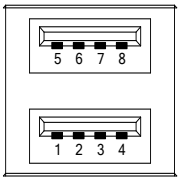
The COM1 Port connector is a RJ-type connector

| Pin | Signal |
|---|---|
| 1 | No use |
| 2 | No use |
| 3 | Transmit Data (TXD) |
| 4 | Ground (GND) |
| 5 | No use |
| 6 | Receive Data (RXD) |
| 7 | No use |
| 8 | No use |



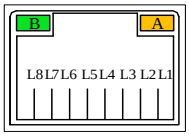
### 2.5.11 USB Port Connector (USB1)

| Pin | Signal |
|---|---|
| 1 | USB VCC (+5V level standby power) |
| 2 | USB #0_D- |
| 3 | USB #0_D+ |
| 4 | Ground (GND) |
| 5 | USB VCC (+5V level standby power) |
| 6 | USB #1_D- |
| 7 | USB #1_D+ |
| 8 | Ground (GND) |




### 2.5.12 Gigabit Ethernet Connector (WAN)

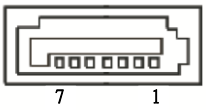
| Pin | Signal |
|---|---|
| L1 | MDI0+ |
| L2 | MDI0- |
| L3 | MDI1+ |
| L4 | MDI1- |
| L5 | MDI2+ |
| L6 | MDI2- |
| L7 | MDI3+ |
| L8 | MDI3- |
| A | Active LED (Orange) |
| B | 100 LAN LED (Amber)/ 1000 LAN LED (Green) |



## 2.5.13 Serial ATA Connectors (SATA1, SATA2)

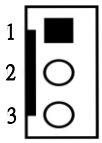
These Serial Advanced Technology Attachment (Serial ATA or SATA) connectors are for high-speed SATA interface ports. SATA2 is co-lay with m-SATA(CN3).

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | Ground (GND) | 2 | TX+ |
| 3 | TX- | 4 | Ground (GND) |
| 5 | RX- | 6 | RX+ |
| 7 | Ground (GND) | | |

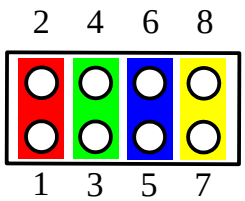



## 2.5.14 Fan Connector (FAN1) (Optional)

| Pin | Signal |
|---|---|
| 1 | Ground (GND) |
| 2 | +12V level |
| 3 | +5V level |




## 2.5.15 Front Panel Bezel Connector (JP1)




**Power LED：**

This 2-pin connector (Pin 1, 2) connects an LED indicator to the system power switch on the case. Pin 2 is assigned as +, and Pin 1 as -. The Power LED lights up when the system is powered ON.

**GPI Pin-header：**

This 2-pin connector (Pin 3, 4) connects the GPI signal to the SoC with pin 4, which allows users to control GPI to be low level.

**System Reset Switch：**

This 2-pin connector (Pin 5, 6) can be connected to the case-mounted reset switch that reboots your computer instead of turning OFF the power switch. This method is a better way to reboot your system for longer life of the system's power supply.

**HDD Activity LED：**

This connection is linked to the hard drive activity LED on the control panel. LED flashes when HDD is being accessed. The 2-pin connector (Pin 7, 8) connects the hard disk drive to the front panel HDD LED, Pin 7 assigned as -, and Pin 8 is assigned as +.

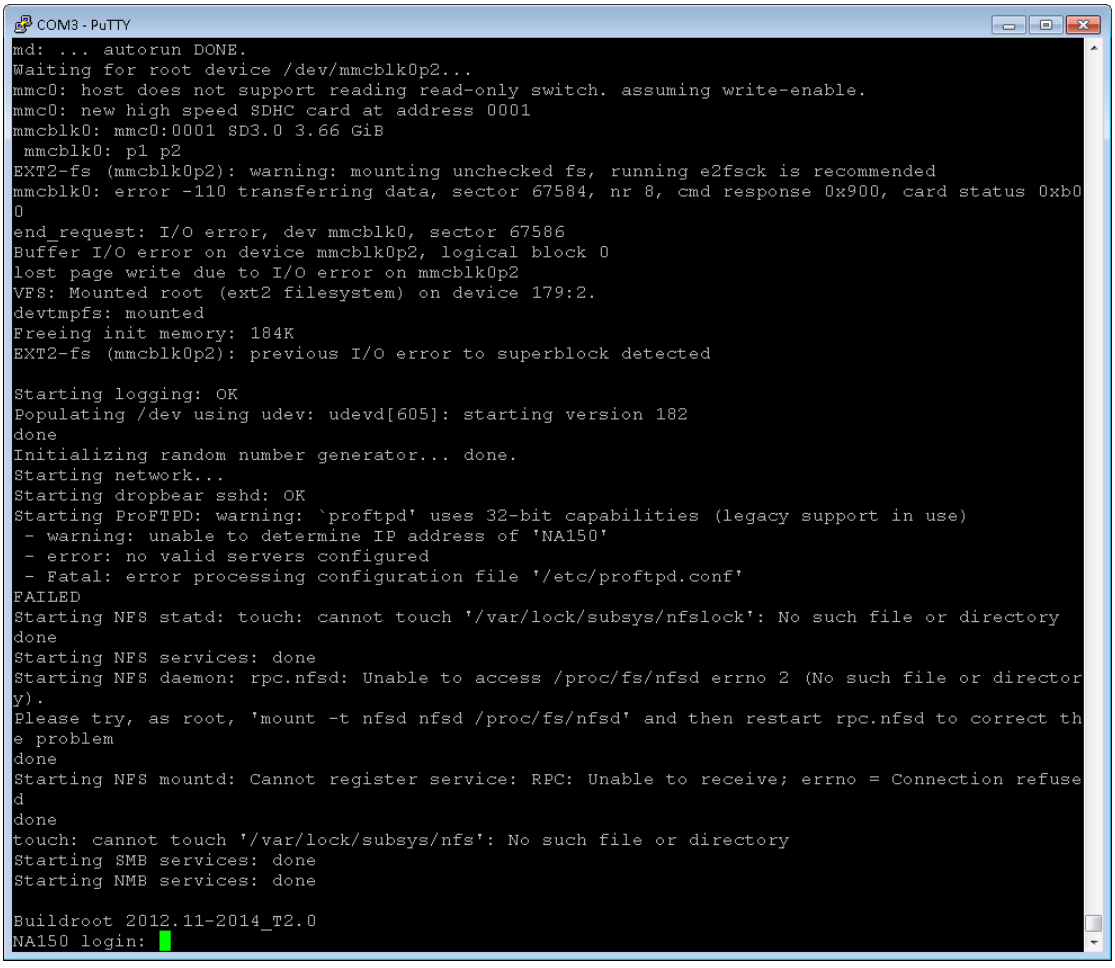
# CHAPTER 3
# SOFTWARE USER GUIDE

This chapter provides users with detailed descriptions on how to set up the basic system configuration.

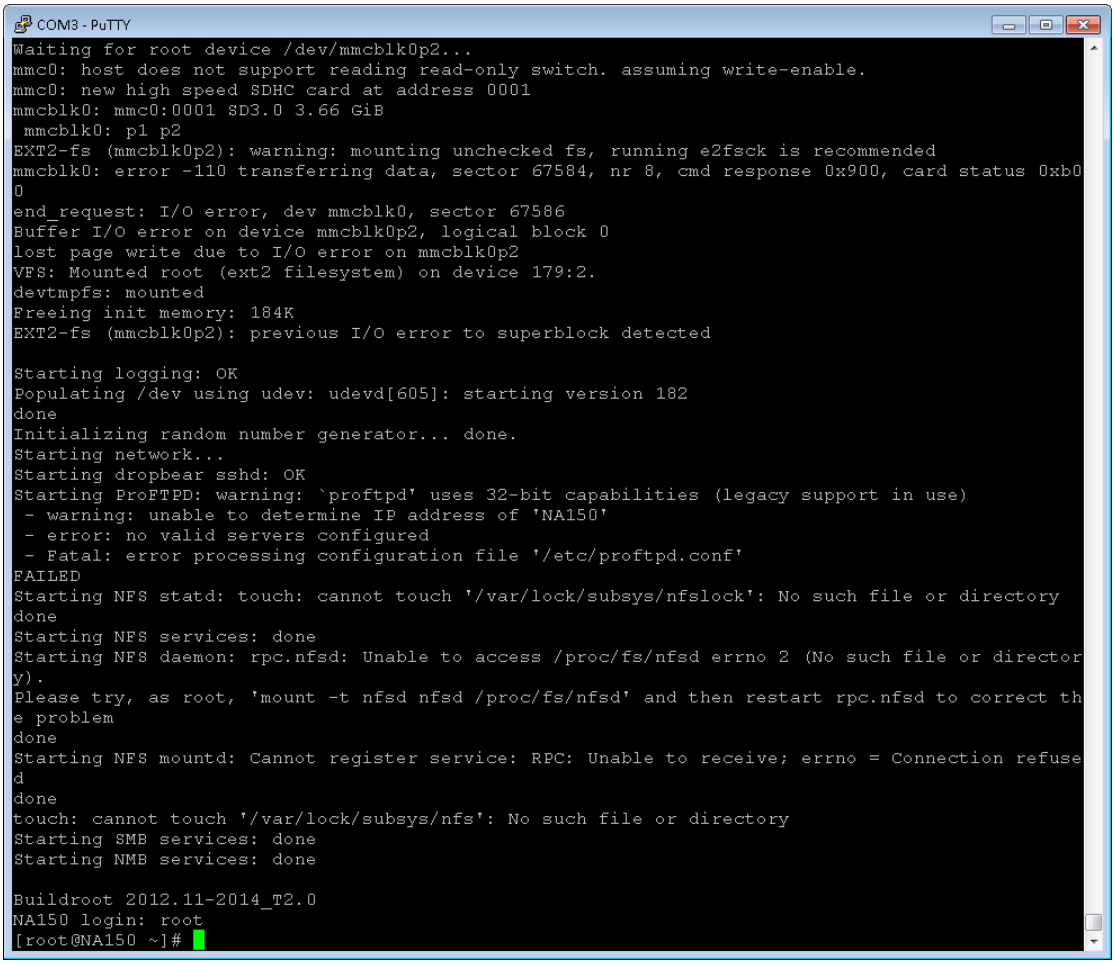
## 3.1 Getting started

Connecting the NA150
You can connect the NA150 to PC via Serial RS-232 console

Baudrate: 115200 bps
Parity: None
Data bits: 8
Stop bit: 1
Flow Control: None


COM3 - PuTTY
md: ... autorun DONE.
Waiting for root device /dev/mmcblk0p2...
mmc0: host does not support reading read-only switch. assuming write-enable.
mmc0: new high speed SDHC card at address 0001
mmcblk0: mmc0:0001 SD3.0 3.66 GiB
mmcblk0: p1 p2
EXT2-fs (mmcblk0p2): warning: mounting unchecked fs, running e2fsck is recommended
mmcblk0: error -110 transferring data, sector 67584, nr 8, cmd response 0x900, card status 0xb0
0
end_request: I/O error, dev mmcblk0, sector 67586
Buffer I/O error on device mmcblk0p2, logical block 0
lost page write due to I/O error on mmcblk0p2
VFS: Mounted root (ext2 filesystem) on device 179:2.
devtmpfs: mounted
Freeing init memory: 184K
EXT2-fs (mmcblk0p2): previous I/O error to superblock detected
Starting logging: OK
Populating /dev using udev: udevd[605]: starting version 182
done
Initializing random number generator... done.
Starting network...
Starting dropbear sshd: OK
Starting ProFTPD: warning: `proftpd' uses 32-bit capabilities (legacy support in use)
- warning: unable to determine IP address of 'NA150'
- error: no valid servers configured
- Fatal: error processing configuration file '/etc/proftpd.conf'
FAILED
Starting NFS statd: touch: cannot touch '/var/lock/subsys/nfslock': No such file or directory
done
Starting NFS services: done
Starting NFS daemon: rpc.nfsd: Unable to access /proc/fs/nfsd errno 2 (No such file or director
y).
Please try, as root, 'mount -t nfsd nfsd /proc/fs/nfsd' and then restart rpc.nfsd to correct th
e problem
done
Starting NFS mountd: Cannot register service: RPC: Unable to receive; errno = Connection refuse
d
done
touch: cannot touch '/var/lock/subsys/nfs': No such file or directory
Starting SMB services: done
Starting NMB services: done
Buildroot 2012.11-2014_T2.0
NA150 login:

If a connection is established successfully, you should see the following image.


COM3 - PuTTY
Waiting for root device /dev/mmcblk0p2...
mmc0: host does not support reading read-only switch. assuming write-enable.
mmc0: new high speed SDHC card at address 0001
mmcblk0: mmc0:0001 SD3.0 3.66 GiB
mmcblk0: p1 p2
EXT2-fs (mmcblk0p2): warning: mounting unchecked fs, running e2fsck is recommended
mmcblk0: error -110 transferring data, sector 67584, nr 8, cmd response 0x900, card status 0xb0
0
end_request: I/O error, dev mmcblk0, sector 67586
Buffer I/O error on device mmcblk0p2, logical block 0
lost page write due to I/O error on mmcblk0p2
VFS: Mounted root (ext2 filesystem) on device 179:2.
devtmpfs: mounted
Freeing init memory: 184K
EXT2-fs (mmcblk0p2): previous I/O error to superblock detected
Starting logging: OK
Populating /dev using udev: udevd[605]: starting version 182
done
Initializing random number generator... done.
Starting network...
Starting dropbear sshd: OK
Starting ProFTPD: warning: `proftpd' uses 32-bit capabilities (legacy support in use)
- warning: unable to determine IP address of 'NA150'
- error: no valid servers configured
- Fatal: error processing configuration file '/etc/proftpd.conf'
FAILED
Starting NFS statd: touch: cannot touch '/var/lock/subsys/nfslock': No such file or directory
done
Starting NFS services: done
Starting NFS daemon: rpc.nfsd: Unable to access /proc/fs/nfsd errno 2 (No such file or director
y).
Please try, as root, 'mount -t nfsd nfsd /proc/fs/nfsd' and then restart rpc.nfsd to correct th
e problem
done
Starting NFS mountd: Cannot register service: RPC: Unable to receive; errno = Connection refuse
d
done
touch: cannot touch '/var/lock/subsys/nfs': No such file or directory
Starting SMB services: done
Starting NMB services: done
Buildroot 2012.11-2014_T2.0
NA150 login: root
[root@NA150 ~]#

To login, please enter 'root' (with no password).

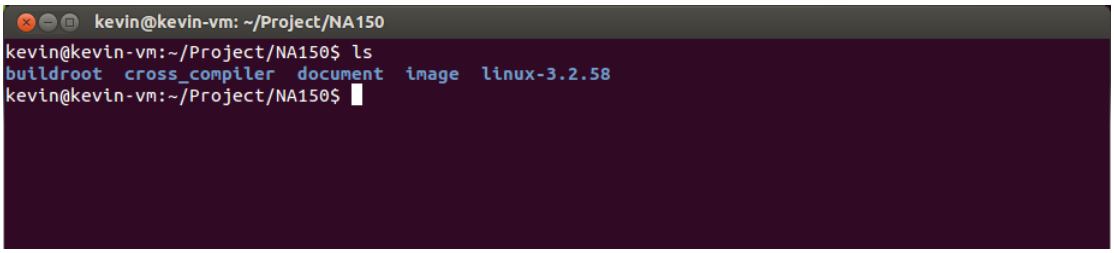
## 3.2 Install development environment

Install Ubuntu 12.04 LTS
Install packages for compile kernel and root file system

```
#sudo apt-get update
#sudo apt-get install libncurses5-dev g++ bison gettext flex texinfo patch git
```

Download and Untar the Linux BSP "NA150-BSP-1.0.0.tar.gz"
Create a folder and untar the BSP

```
# mkdir ~/Project/NA150 –p
# tar –zxf NA150-BSP-1.0.0.tar.gz –C ~/Project/NA150
```




After untar the BSP, you will see following folders

Install cross compiler for NA150

```
# cd ~/Project/NA150/cross_compiler
# sudo tar –jxf armv7-marvell-linux-gnueabi-hard_i686_64K_Dev_20131002.tar.bz2 –C /opt
```

## 3.3 Compile the Linux kernel

Change to kernel source folder

```
# cd linux-3.2.58
```

Set the environment variable (To configure the developing environment automatically)

```
# source setenv.sh
```

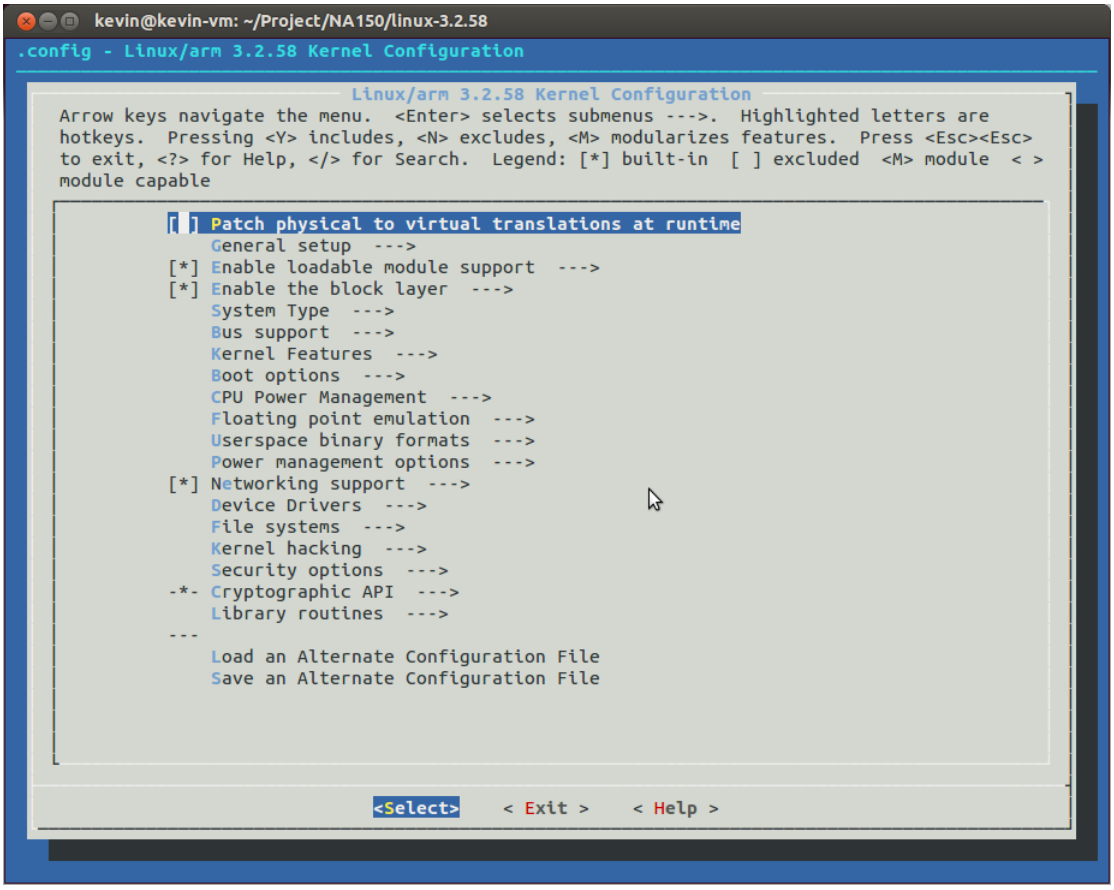
You can modify the setenv.sh by yourself, if you change the path of cross compiler.
Generate .config file

```
# make na150_defconfig
```

Modify and compile the Kernel

```
# make menuconfig
```

You can modify the kernel by youself as seen below:


kevin@kevin-vm: ~/Project/NA150/linux-3.2.58
.config - Linux/arm 3.2.58 Kernel Configuration
Linux/arm 3.2.58 Kernel Configuration
Arrow keys navigate the menu. <Enter> selects submenus --->. Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < > module capable
[ ] Patch physical to virtual translations at runtime
General setup --->
[*] Enable loadable module support --->
[*] Enable the block layer --->
System Type --->
Bus support --->
Kernel Features --->
Boot options --->
CPU Power Management --->
Floating point emulation --->
Userspace binary formats --->
Power management options --->
[*] Networking support --->
Device Drivers --->
File systems --->
Kernel hacking --->
Security options --->
-*- Cryptographic API --->
Library routines --->
---
Load an Alternate Configuration File
Save an Alternate Configuration File
<Select> < Exit > < Help >

After modifying the kernel, use 'make' to compile the kernel

```
# make uImage
```

The kernel image "uImage" will appear in arch/arm/boot

## 3.4 Compile root file system

Change to buildroot folder

```
# cd ~/Project/NA150/buildroot
```

Set the environment variable (To configure the developing environment automatically)

```
# source setenv.sh
```

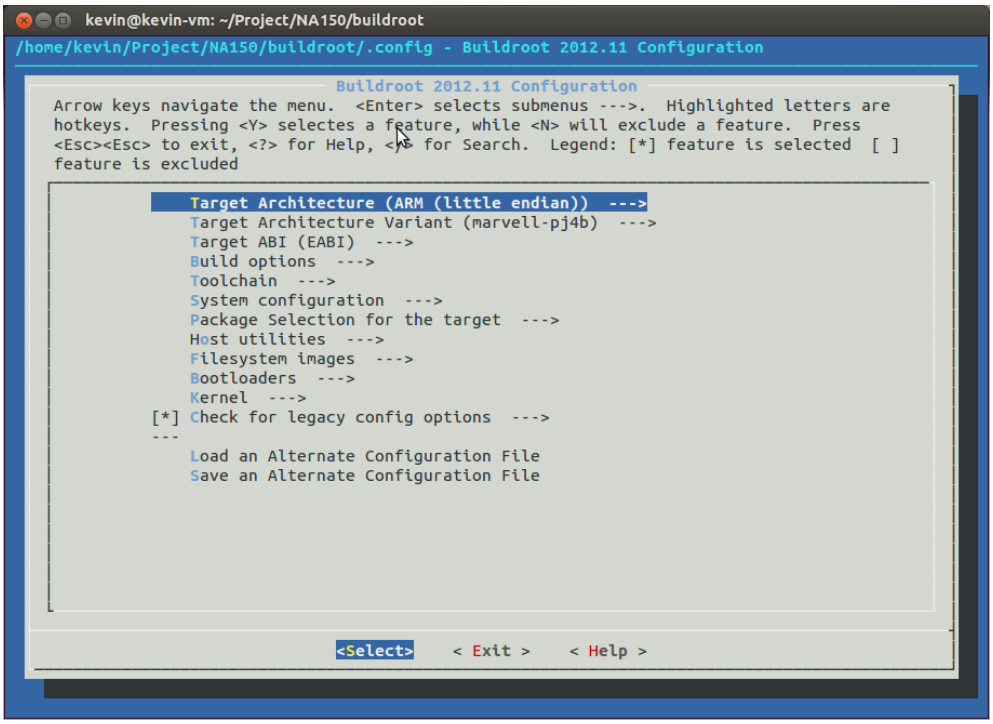
Generate .config file

```
# make na150_defconfig
```

Modify and compile the root file system

```
# make menuconfig
```

You can choose packages you want to add in the root file system:


kevin@kevin-vm: ~/Project/NA150/buildroot
/home/kevin/Project/NA150/buildroot/.config - Buildroot 2012.11 Configuration
Buildroot 2012.11 Configuration
Arrow keys navigate the menu. <Enter> selects submenus --->. Highlighted letters are hotkeys. Pressing <Y> selectes a feature, while <N> will exclude a feature. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] feature is selected [ ] feature is excluded
Target Architecture (ARM (little endian)) --->
Target Architecture Variant (marvell-pj4b) --->
Target ABI (EABI) --->
Build options --->
Toolchain --->
System configuration --->
Package Selection for the target --->
Host utilities --->
Filesystem images --->
Bootloaders --->
Kernel --->
[*] Check for legacy config options --->
---
Load an Alternate Configuration File
Save an Alternate Configuration File
<Select>
< Exit >
< Help >

After configuration root file system, use 'make' to build root file system

```
# make
```

The root file system "rootfs.tar" will in /output/image/

## 3.5 Put kernel and root file system into SD card

SD card has two partitions: the first partition is kernel image(fat32), the second partition is root file system(ext2)

Use the card reader to connect to host PC(Ubuntu 12.04 LTS)
Mount SD card
Mount partition 1 in /mnt/sdcard_1

```
# sudo mkdir /mnt/sdcard_1
```

```
# mount /dev/sdc1 /mnt/sdcard_1(sdc1 is device name)
```

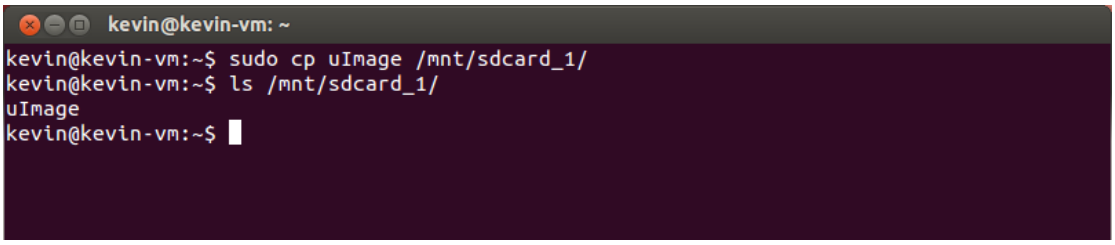
Mount partition 1 in /mnt/sdcard_2

```
# sudo mkdir /mnt/sdcard_2
```

```
# mount /dev/sdc2 /mnt/sdcard_2(sdc2 is device name)
```

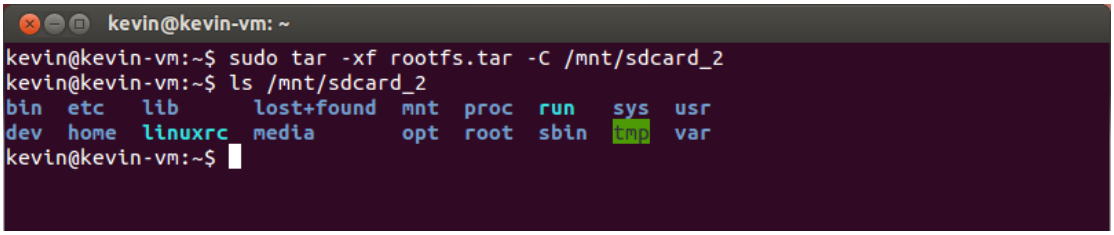
Copy kernel image into partition 1

```
# sudo cp uImage /mnt/sdcard_1
```




Untar root file system into partition 2

```
# sudo tar –xf rootfs.tar –C /mnt/sdcard_2
```


kevin@kevin-vm: ~
kevin@kevin-vm:~$ sudo tar -xf rootfs.tar -C /mnt/sdcard_2
kevin@kevin-vm:~$ ls /mnt/sdcard_2
bin etc lib lost+found mnt proc run sys usr
dev home linuxrc media opt root sbin tmp var
kevin@kevin-vm:~$

## 3.6 Compile Sample Program

Add cross-compiler to the PATH

```
# export PATH=/opt/armv7-marvell-linux-gnueabi-
hard_i686_64K_Dev_20131002/bin:$PATH
```

Create a directory for sample program

```
# cd ~/Project/NA150
# mkdir sample
# cd sample
```

Use vi to edit hello.c

```
# vi hello.c
#include<stdio.h>
int main()
{
      printf("hello world\n");
       return 0;
}
```

Compile the sample program

```
# arm-marvell-linux-gnueabi-gcc hello.c –o hello
```

After compiling, enter command "ls" and you can see the 'hello' execution file.

How to Put and Run a Sample Program Via USB Flash Drive

From the host, copy 'hello' program to USB flash drive.

Attach USB flash drive to NA150.

```
# mkdir /mnt/usb –p
# mount /dev/sda1 /mnt/usb
# cp /mnt/usb/hello /root
# cd /root
# chmod +x hello
# ./hello
```

Via TFTP

The Host Development System Installation already has a TFTP server installed.
In the host:

```
# cp hello /tftpboot
```

In the target:

```
# tftp –g –r hello 192.168.0.3 (tftp server IP)
# chmod +x hello
# Run the 'hello' program.
#./hello
```

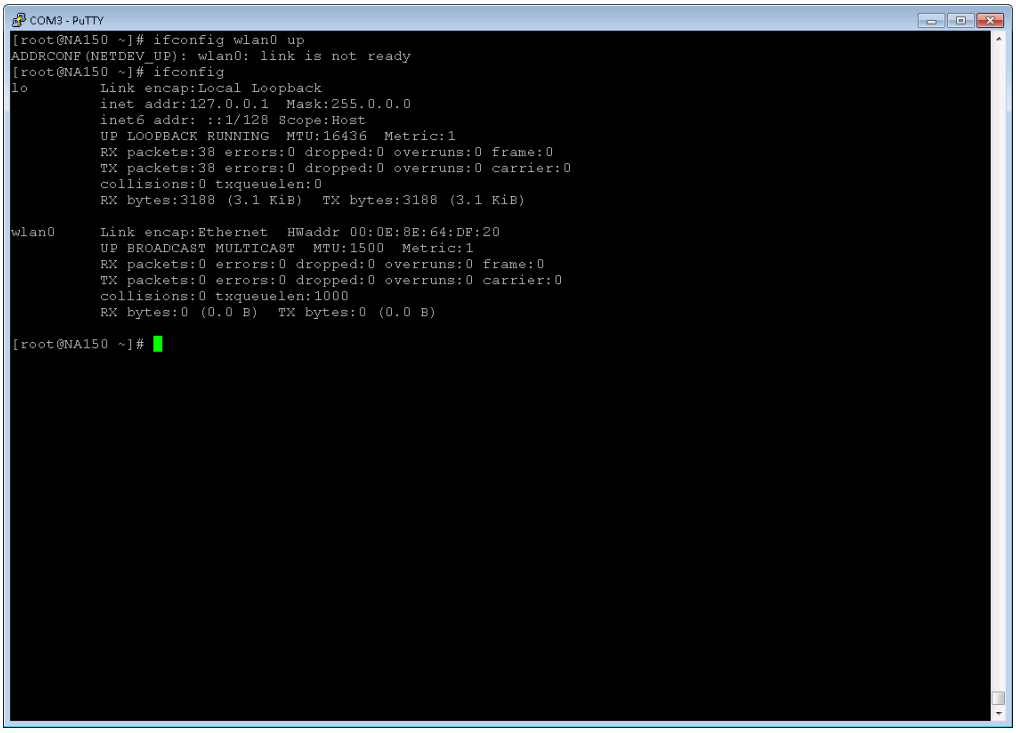
## 3.7 How to use WiFi

Install WiFi module (WPEA-121N/W Atheros AR9382) on Mini PCIe slot then boot up into OS with username (no need password). Excute commands as below to start the WiFi interface.

```
$ ifconfig wlan0 up
```

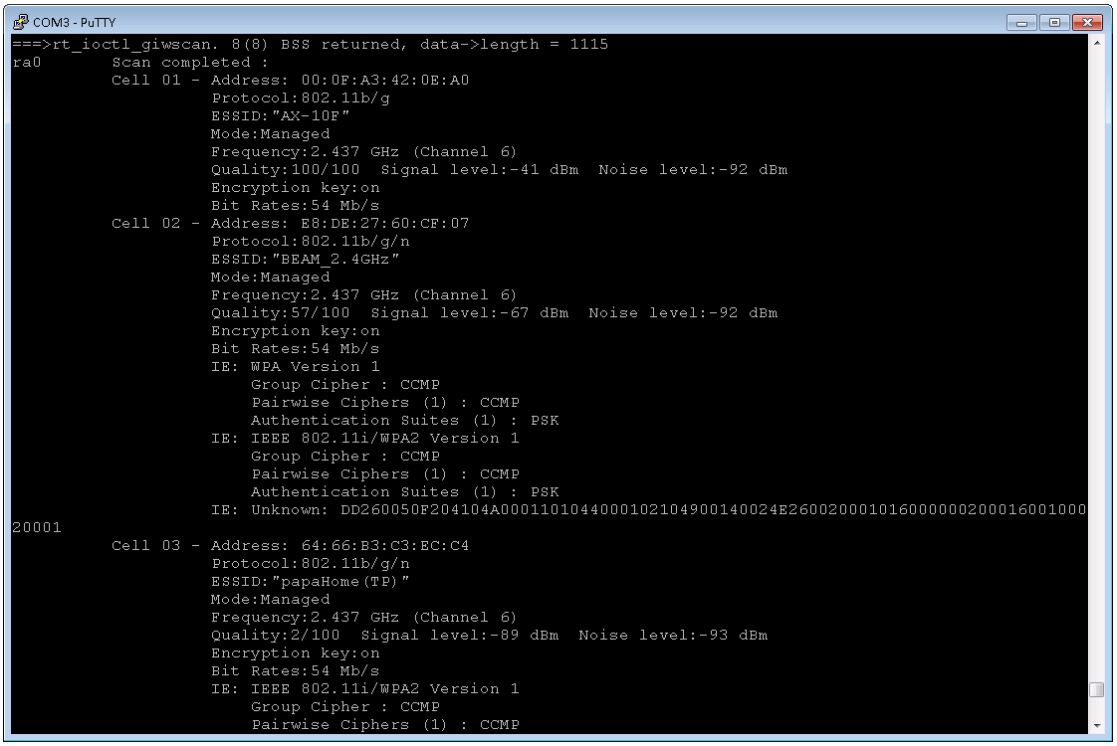
If WiFi module starts success, enter following command you will see wlan0 interface

```
$ ifconfig
```


COM3 - PuTTY
[root@NA150 ~]# ifconfig wlan0 up
ADDRCONF(NETDEV_UP): wlan0: link is not ready
[root@NA150 ~]# ifconfig
lo Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:38 errors:0 dropped:0 overruns:0 frame:0
TX packets:38 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:3188 (3.1 KiB) TX bytes:3188 (3.1 KiB)
wlan0 Link encap:Ethernet HWaddr 00:0E:8E:64:DF:20
UP BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
[root@NA150 ~]#

Scan AP

```
$ iwlist wlan0 scan
```




Connect AP use wpa_supplicant

- Configure wpa_supplicant

  $ vi example.conf

  ctrl_interface=/var/run/wpa_supplicant(you must add this this in the first line)

  - configure Encryption as disable and no authentication type

    network={
    ssid="AP_SSID"

    key_mgmt=NONE
    }

  - configure Encryption as WEP Open type

    network={
    ssid=" AP_SSID "
    key_mgmt=NONE
    auth_alg=OPEN
    wep_key0=0123456789
    wep_tx_keyidx=0
    }

  - configure Encryption as WEP and shared key as authentication type

    network={
    ssid=" AP_SSID "
    key_mgmt=NONE
    auth_alg=SHARED
    wep_key0=0123456789
    wep_tx_keyidx=0
    }

  - configure Encryption as TKIP and WPA-PSK as authentication type

    network={

```
        ssid=" AP_SSID "
        pairwise=TKIP
        group=TKIP
        proto=WPA
        key_mgmt=WPA-PSK
        psk="12345678"
}
```

- configure Encryption as CCMP and WPA-PSK as authentication type

```
network={
        ssid=" AP_SSID "
        pairwise=CCMP
        group=CCMP
        proto=WPA
        key_mgmt=WPA-PSK
        psk="12345678"
}
```

- configure encryption as CCMP and WPA2-PSK as authentication type

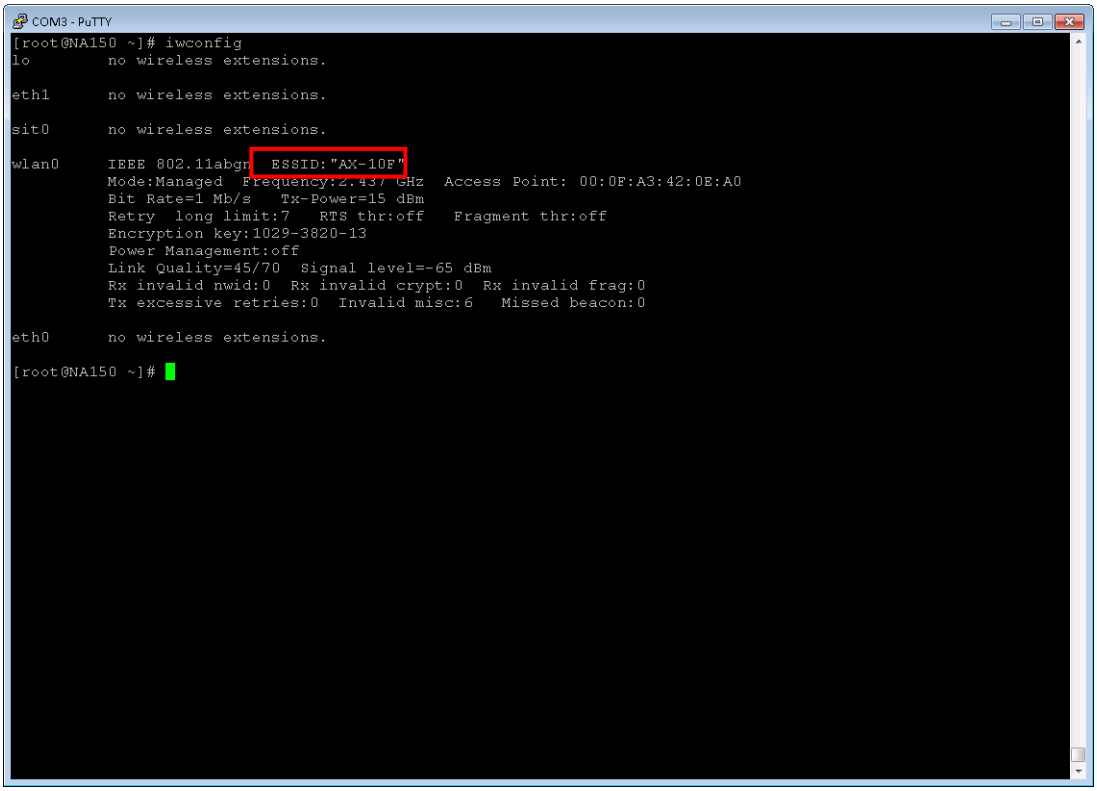
```
network={
        ssid=" AP_SSID "
        pairwise=CCMP
        group=CCMP
        proto=RSN
        key_mgmt=WPA-PSK
        psk="12345678"
}
```

- Excute wpa_supplicant to connect to AP

  ```
  $ wpa_supplicant -BDwext -i wlan0 -c example.conf
  ```

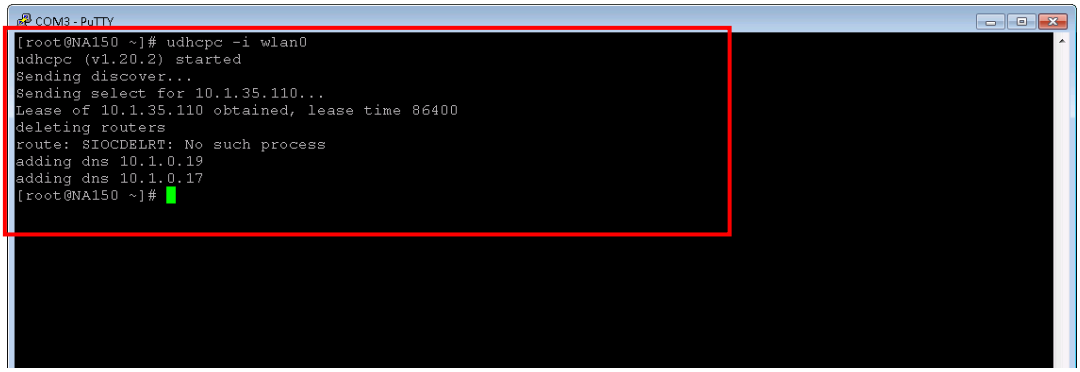
  If connect success, type command iwconfig, you will see below image

  ```
  $ iwconfig
  ```


COM3 - PuTTY
[root@NA150 ~]# iwconfig
lo no wireless extensions.
eth1 no wireless extensions.
sit0 no wireless extensions.
wlan0 IEEE 802.11abgn ESSID:"AX-10F"
Mode:Managed Frequency:2.437 GHz Access Point: 00:0F:A3:42:0E:A0
Bit Rate=1 Mb/s Tx-Power=15 dBm
Retry long limit:7 RTS thr:off Fragment thr:off
Encryption key:1029-3820-13
Power Management:off
Link Quality=45/70 Signal level=-65 dBm
Rx invalid nwid:0 Rx invalid crypt:0 Rx invalid frag:0
Tx excessive retries:0 Invalid misc:6 Missed beacon:0
eth0 no wireless extensions.
[root@NA150 ~]#

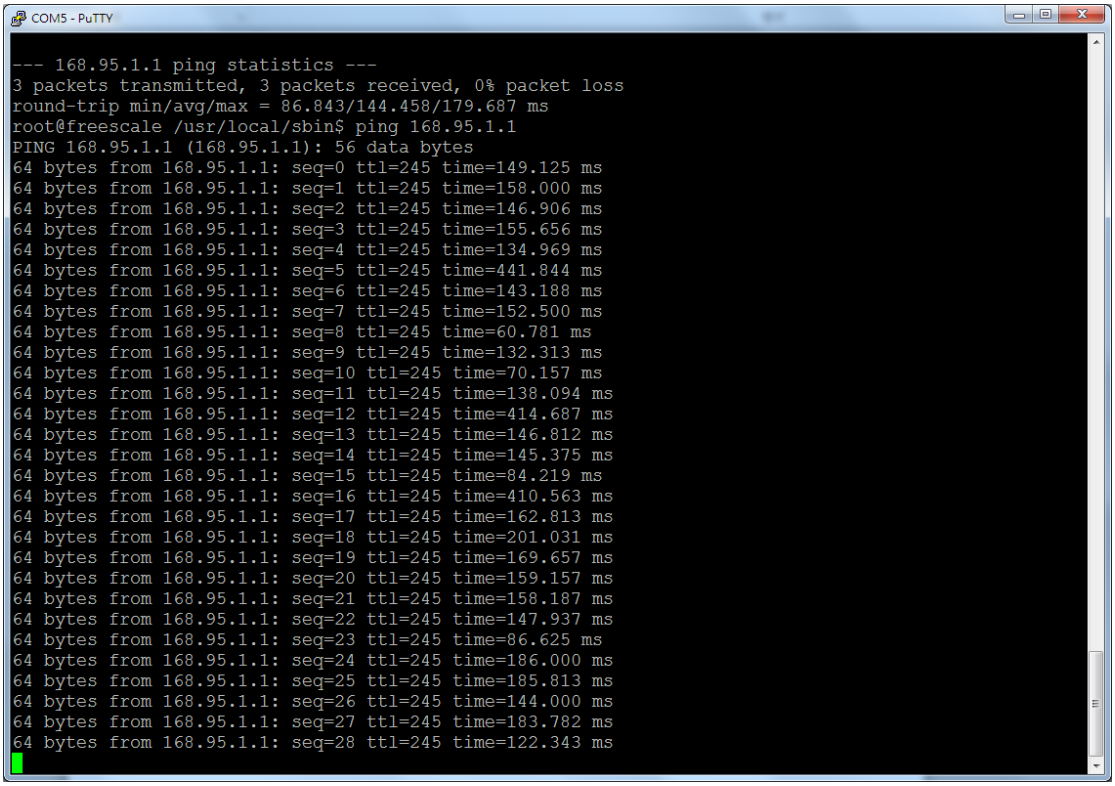
- Get IP from AP

  $ udhcpc -i wlan0




- Test WiFi connection use ping

  $ ping -I wlan0 168.95.1.1


COM5 - PuTTY
--- 168.95.1.1 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 86.843/144.458/179.687 ms
root@freescale /usr/local/sbin$ ping 168.95.1.1
PING 168.95.1.1 (168.95.1.1): 56 data bytes
64 bytes from 168.95.1.1: seq=0 ttl=245 time=149.125 ms
64 bytes from 168.95.1.1: seq=1 ttl=245 time=158.000 ms
64 bytes from 168.95.1.1: seq=2 ttl=245 time=146.906 ms
64 bytes from 168.95.1.1: seq=3 ttl=245 time=155.656 ms
64 bytes from 168.95.1.1: seq=4 ttl=245 time=134.969 ms
64 bytes from 168.95.1.1: seq=5 ttl=245 time=441.844 ms
64 bytes from 168.95.1.1: seq=6 ttl=245 time=143.188 ms
64 bytes from 168.95.1.1: seq=7 ttl=245 time=152.500 ms
64 bytes from 168.95.1.1: seq=8 ttl=245 time=60.781 ms
64 bytes from 168.95.1.1: seq=9 ttl=245 time=132.313 ms
64 bytes from 168.95.1.1: seq=10 ttl=245 time=70.157 ms
64 bytes from 168.95.1.1: seq=11 ttl=245 time=138.094 ms
64 bytes from 168.95.1.1: seq=12 ttl=245 time=414.687 ms
64 bytes from 168.95.1.1: seq=13 ttl=245 time=146.812 ms
64 bytes from 168.95.1.1: seq=14 ttl=245 time=145.375 ms
64 bytes from 168.95.1.1: seq=15 ttl=245 time=84.219 ms
64 bytes from 168.95.1.1: seq=16 ttl=245 time=410.563 ms
64 bytes from 168.95.1.1: seq=17 ttl=245 time=162.813 ms
64 bytes from 168.95.1.1: seq=18 ttl=245 time=201.031 ms
64 bytes from 168.95.1.1: seq=19 ttl=245 time=169.657 ms
64 bytes from 168.95.1.1: seq=20 ttl=245 time=159.157 ms
64 bytes from 168.95.1.1: seq=21 ttl=245 time=158.187 ms
64 bytes from 168.95.1.1: seq=22 ttl=245 time=147.937 ms
64 bytes from 168.95.1.1: seq=23 ttl=245 time=86.625 ms
64 bytes from 168.95.1.1: seq=24 ttl=245 time=186.000 ms
64 bytes from 168.95.1.1: seq=25 ttl=245 time=185.813 ms
64 bytes from 168.95.1.1: seq=26 ttl=245 time=144.000 ms
64 bytes from 168.95.1.1: seq=27 ttl=245 time=183.782 ms
64 bytes from 168.95.1.1: seq=28 ttl=245 time=122.343 ms

- Disconnect WiFi connection

  $ wpa_cli -i wlan0 terminate

## 3.8 How to use GPIO to control status LED and push buttons

NA150 has 2 push buttons and 1 status led can be controlled via GPIO pins

Led control

# echo 64 > /sys/class/gpio/export ➔ enable gpio pin

# echo out > /sys/class/gpio/gpio64/direction ➔ change direction to out

# echo 0 > / sys/class/gpio/gpio64/value ➔ trun on the led

# echo 1 > / sys/class/gpio/gpio64/value ➔ trun off the led

Get push button status(SW1 is gpio pin 32, SW2 is gpio pin 38)

# echo 32 > /sys/class/gpio/export ➔ enable gpio pin

# cat /sys/class/gpio/gpio32/value

If button is held, the value is 1

If button is released, the value is 0

# APPENDIX A
# WARNING

- This is a class B Product. In a domestic Environment this Product may cause radio interference in which case the user may be required to take adequate measures.

- It will be dangerous if the battery is incorrectly replaced. Replacing only with the same or equivalent type is highly recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

**Warning for Hard Disk Drive Selection:**

TUV approved Hard Disk Drive is preferred for TUV compliance Hard Disk drive-Optional, (NWGQ2), generic, Input Voltage rated 5V dc/1.0A, 12V dc/1.8A maximum. Minimum clearance from uninsulated live parts 4.0 mm.

"The equipment is to be installed in an environment where maximum ambient temperature will not exceed 45°C."

"The openings on the enclosure are for air convection to protect the equipment from overheating.

DO NOT COVER THE OPENINGS."

"Lay this equipment on a reliable surface during installation

A drop or fall could cause injury."

"The equipment shall be installed according to specification as nameplate. Make sure the voltage of the power source when connect the equipment to the power outlet.

The load current and load output should not exceed specification.""This equipment must be connected to a reliable grounding source before using."

**Electric shock hazard inside the redundant power supply**
The exchange of modules shall be done by service person.

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